Today's Stereo

HOW THEY CAPTURE IT

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There was a time when stereo sound meant exaggerated Ping-Pong-like musical effects. You carefully positioned yourself between two stereo speakers and heard the horns blaring from the left and the drums booming from the right, both flanking a silent "hole" in the middle.

Today, happily, stereo sound is synonymous with realism. When you listen to a modern stereo record, you get a sensation of depth as well as width. The hole-in-the-middle has been replaced by the illusion of a smooth wall of sound. And this aural magic has been accompanied by increased frequency range and less distortion.

What's the secret? There are many, and therein lies an exciting tale. Come along with PS as we trace the steps in the

Sound:

ON RECORDS

birth of a brand-new stereo record: the latest Project-3 pop-tune album, titled *Listen to Your Heart*.

We begin, naturally enough, in a recording studio, but first let's introduce the people at work.

The vocalists are a fast-rising group of eight men and four women who call themselves the Kissin' Cousins; they are accompanied by the 10-man Lew Davies Orchestra.

The producer is Enoch Light, the well-

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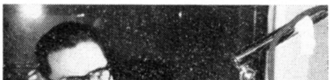
For peak fidelity: a different mike for every instrument

Acoustic guitar: a Sennheiser condenser mike.

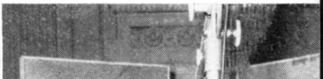
Electric guitar: a Sennheiser dynamic mike.

Bongo drums: a Telefunken U-47 dynamic microphone.

Drums: a directional Senheiser "shotgun."

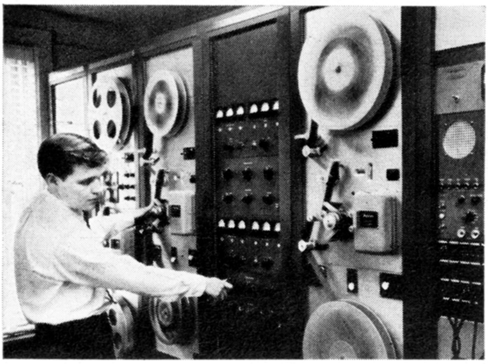


Trumpet: a Church dynamic microphone is used.

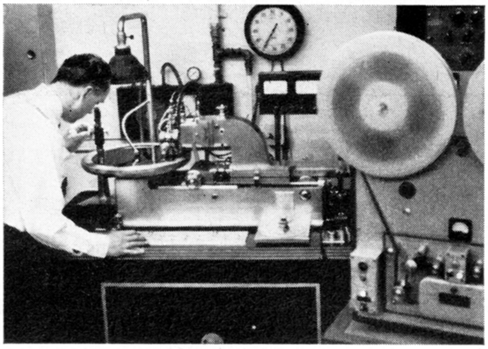


Vocalists: three U-47 dynamic microphones.

Seated at the master control console in the soundproofed control room are (left to right): Julie Klages, assistant producer; Enoch Light, producer; and Robert Fine, chief recording engineer. Photos on this and the previous page were taken in the sound studios of Fine Recording, Inc., NYC.



Performers are recorded on dual 35mm magnetic film recorders (above). Magnetic film, although superior to conventional magnetic recording tape in most respects, is not used universally in the recording industry because of its high cost: roughly 15 times the price of magnetic tape.



Film-recorded "takes" are transferred to two master disks—one for each side of the finished record—by a complex electromechanical, lathe-driven cutting head. The two cut masters are playable one-sided phonograph records, complete with lead-in and lead-out grooves and blank bands between tunes.

Stereo sound is born inside the soundproofed control room

known orchestra leader and composer turned record maker. Before founding the Project-3 label, he produced scores of stereo albums for the Grand Award and Command labels. His assistant during this recording session is Julie Klages; the chief recording engineer is Robert Fine.

Inside the recording studio, there's no "left," "right," or "middle": The orchestra is formed in a rough circle; the vocalists are huddled in a tight cluster off to one side. Both groups are surrounded by a forest of boom-mounted microphones.

A different type of microphone is used for each instrument. The reason is that every microphone, no matter how high its price tag and quality, tends to add a small—but distinctive—trace of "coloration" to the sounds it picks up. By experimenting, audio engineers have determined which mike captures the sound of each instrument with the greatest fidelity.

Blending voices and instruments. The outputs of the individual instrument mikes, and of the three mikes the vocalists sing into, are amplified separately and then blended together electronically—by a mixer-amplifier—to create three sound channels: left, center, and right. Later, these will be combined into two channels—left and right—when the master record is cut.

It's at this point that what we've called stereo sound is born: The producer and recording engineer, monitoring the mike outputs at ear-shattering volume, carefully decide which instruments and which vocalists are placed on what channel or channels, and control the relative volume of each. As each tune to be recorded is rehearsed, these electronic variables are juggled and rejuggled until the desired effect has been achieved. This step is crucial since it controls the seeming location of each instrument that you will hear when you replay the finished record.

The three sound channels are recorded only during an actual "take." From the control room, the signals are piped simultaneously to two three-track, 35mm magnetic film recorders. Magnetic film looks exactly like the photo film you load in

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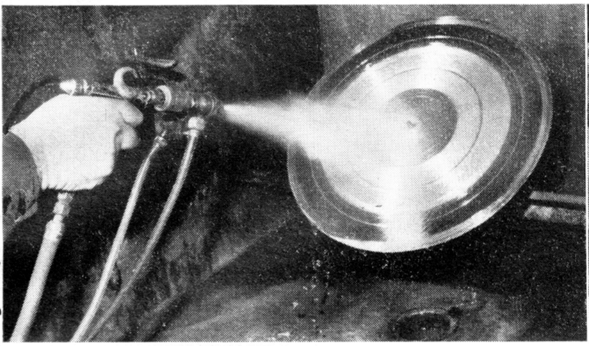
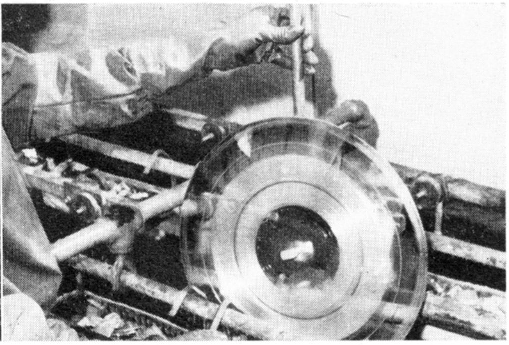
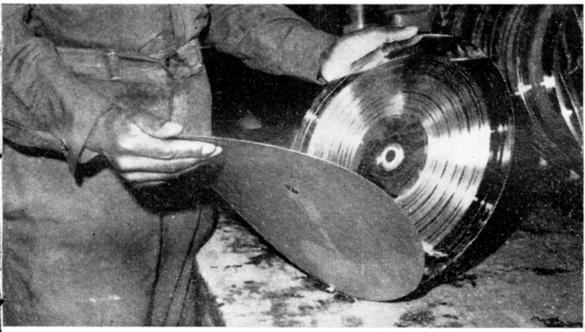
From lacquer master to finished records: an 11-step process



1 **Lacquer master** is cleaned with a detergent, then sprayed simultaneously (above) by a two-nozzle spray gun, with solution of silver nitrate in ammonia, and with formaldehyde. The resulting chemical reaction deposits an ultrathin electrically conductive layer of pure silver on the surface.

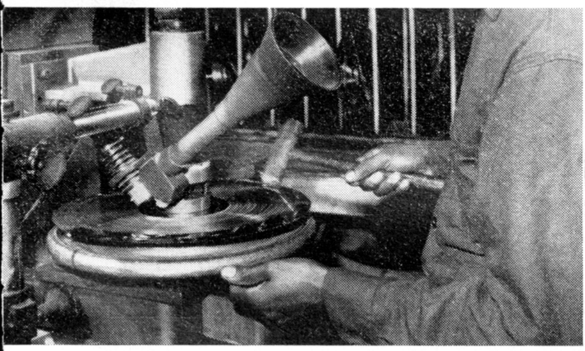


2 **Silvered master** is first dipped in a dichromate solution and then placed in an electroforming tank (above). Electroforming is a process similar to electroplating, except that it is capable of higher precision. This step builds up a thick layer of pure nickel against the silvered master surface.

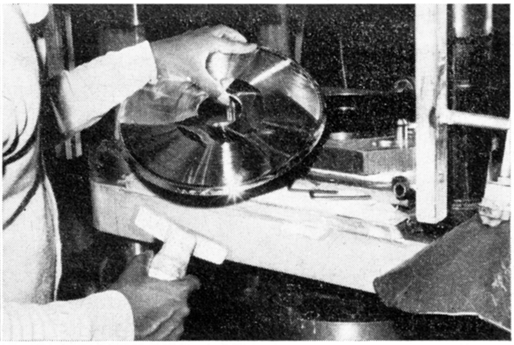


3 **Nickel "second master"** is pulled away from the silvered lacquer master—chromate bath prevents nickel from adhering to silver. The second master is a "negative" of the first. Now, through an identical sequence of steps, the second master is used to make a positive—the "mother."

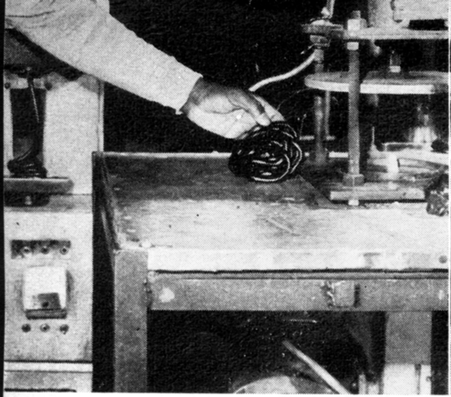
4 **The mother** is a pure-nickel copy of the lacquer master. It is test-played (above) to make sure that it is flawless, then used (by the same process described earlier) to make additional nickel negatives, called "stampers," which will be used to press the finished vinyl-plastic records.



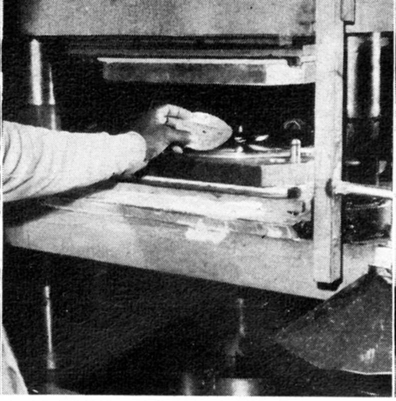
5 **In a very important step,** the stamper is placed on an optical alignment jig and the precise center-hole location found. The record is spun slowly in the jig and edge-tapped with a soft-faced mallet until the correct center-hole location is directly beneath a punch. Then the hole is cut.



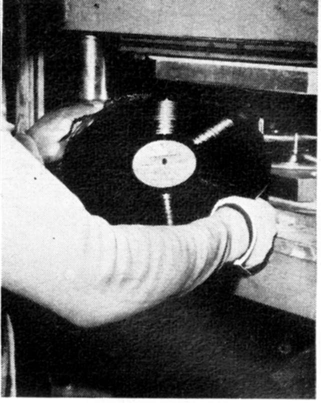
6 **Stamper's center hole** is considerably larger than the hole on the finished record, since it's designed to fit into a mechanical press. Here the stamper is mounted inside the record press over a round die. A second stamper, for the other side, is mounted on an identical upper die.



7 **Automatic weighing machine** dispenses the correct amount of heat-softened black vinyl rod (left, in photo). This is squeezed into a flat, roughly round "biscuit," with a hole through its center, by hydraulic press (right).



8 **Sandwich** of bottom label, biscuit, and top label is built by worker inside the record press. As the press closes, hot water flows through the coils inside the dies, heating the stampers and melting the black vinyl.



9 **Melted vinyl** flows between the two hot stampers, filling the grooves like waffle batter and forming a record. The two paper labels are literally welded into the vinyl. Cold water then cools the dies, and the record is removed.

10 **Flashing** on record's rough edge is cut off, the edge is smoothed, record surface is inspected for obvious imperfections, and then (above) it is slipped into a paper sleeve and sent, via conveyor belt, to the packaging area.

11 **Fancy cardboard jacket** is placed over the paper sleeve, and finally an outer protective plastic film wrapping is vacuum-formed around the jacket. The completed album is now ready to go to your record shop.

your 35mm camera. But it's covered with a coating of reddish-brown magnetic recording iron oxide instead of a photographic emulsion.

Magnetic film is employed, rather than the far less costly tape, because of its superior characteristics—especially its much lower background noise level.

The use of two film machines is a safety precaution that insures at least one perfect recording in case one recorder should fail during a take. The film recorders work in much the same way as conventional home tape machines, except that they have elaborate sprocket-equipped transports that engage the film's edge perforations.

The master disks. The next step is to cut the master disks. As the film recorders play back the takes, the middle sound channel is split electronically, and the two halves are added to the left and right channels to produce two composite signals that are amplified and fed to the disk cutting head. This "backwards" phono cartridge is drawn across the spinning surface of a precision-blank lacquer-coated aluminum disk by a complex lathe mechanism. The two channel input signals make the cutting head's stylus vibrate and jump in the freshly cut spiral groove, to create the undulating patterns that your phono cartridge will convert back into electrical signals when you play the finished record. Two masters are made, one for each side of the record.

The completed masters are playable one-sided records—but they are much too valuable to play. Instead, they are shipped to a stamping plant where they are used to make "stampers"—or molds—that will mass-produce the finished records by the thousands from "biscuits" of soft, black vinyl.

The multistage process of master-to-stamper-to-finished-record is pictured here and on the previous page. These photos were taken at the Sonic Recording Products plant in Hicksville, N.Y., but similar processes are used throughout the record industry. PS